IN THE CLAIMS:

This listing of claims replaces all prior versions o the claims in the application. Please cancel claims 1-55 of the application without prejudice to or disclaimer of the subject matter therein. Please add new claims 56-75.

56. (New) An apparatus, comprising:

a linkage including a plurality of members, the linkage configured to provide at least two rotary degrees of freedom about a pivot point, the pivot point located at an intersection of axes of rotation of at least two members from the plurality of members;

a manipulandum coupled to at least one member from the plurality of members, the manipulandum being moveable with respect to the pivot point, the manipulandum being disposed on a first side of a plane including the pivot point and the linkage being disposed on a second side of the plane different from the first side of the plane; and

a sensor configured to measure a rotation of the manipulandum and configured to provide at least one sensor signal associated with a position of the manipulandum.

57. (New) The apparatus of claim 56, wherein:

the pivot point is located remotely from the plurality of members, the manipulandum being movable in the at least two rotary degrees of freedom within a spherical workspace, the pivot point being located at a center of a sphere defined by the spherical workspace.

58. (New) The apparatus of claim 56, wherein:

the manipulandum is further configured to be moved in a linear degree of freedom through the pivot point.

59. (New) The apparatus of claim 56, wherein:

the manipulandum is disposed on the first side of the plane and the linkage is disposed on the second side of the plane when the manipulandum and the linkage are collectively in a first configuration; and

at least a portion of the manipulandum extends through the pivot point when the manipulandum and the linkage are collectively in a second configuration different from the first configuration.

60. (New) The apparatus of claim 56, wherein:

the manipulandum is independently translatable with respect to the linkage along a linear degree of freedom through the pivot point.

61. (New) The apparatus of claim 56, further comprising:

an actuator coupled to at least one of the manipulandum and the linkage, the actuator configured to apply a force to a member from the plurality of members, in a linear degree of freedom.

62. (New) The apparatus of claim 56, further comprising:

an actuator coupled to at least one of the manipulandum and the linkage, the actuator configured to apply a force to a member from the plurality of members, in a rotary degree of freedom.

63. (New) A method, comprising:

receiving sensor data from a sensor associated with an interface apparatus, the sensor data being associated with a position of a manipulandum in one of a first rotary degree of freedom, a second rotary degree of freedom and a linear degree of freedom, the manipulandum being moveable in each of the first rotary degree of freedom, the second rotary degree of freedom and the linear degree of freedom;

selecting a physical property profile from a plurality of physical property profiles based on the position of the manipulandum; and

sending a force signal to an actuator of the interface apparatus, the force signal being based on, at least in part, the physical property value of the selected physical property profile.

64. (New) The method of claim 63, wherein:

a pivot point is located at an intersection of an axis of rotation associated with the first rotary degree of freedom and an axis of rotation associated with the second rotary degree of freedom; and

the manipulandum is disposed on a first side of a plane including the pivot point, the interface apparatus being disposed on a second side of the plane different from the first side of the plane.

65. (New) The method of claim 63, wherein:

a pivot point is located at an intersection of an axis of rotation associated with the first rotary degree of freedom and an axis of rotation associated with the second rotary degree of freedom; and

the pivot point is located remotely from the interface apparatus, the manipulandum being movable in the at least two rotary degrees of freedom within a spherical workspace, the pivot point being located at a center of a sphere defined by the spherical workspace.

66. (New) The method of claim 63, wherein:

the interface apparatus includes a closed loop spherical mechanism configured to provide the first rotary degree of freedom and the second rotary degree of freedom to the manipulandum.

67. (New) The method of claim 63, the physical property profile being a first physical property profile, the interface apparatus being configured to execute an epidural anesthesia delivery simulation, the manipulandum including a needle having a syringe, the method further comprising:

selecting a second physical property profile from the plurality of physical property profiles when the needle is retracting in a simulated tissue of a simulated patient, the first physical property being selected when the needle is advancing in the simulated tissue of the simulated patient.

68. (New) The method of claim 63, the interface apparatus being configured to execute a medical simulation, the method further comprising:

determining a position of the manipulandum within a simulated tissue of a simulated patient, the physical property profile being selected based on the position of the manipulandum within the simulated tissue.

69. (New) The method of claim 63, the interface apparatus being configured to execute a medical simulation, the method further comprising:

determining a position of the manipulandum within a simulated tissue of a simulated patient,

the physical property profile being selected based on the position of the manipulandum within the simulated tissue, the force signal is operative to output forces simulating the manipulandum encountering a simulated bone.

70. (New) The method of claim 63, wherein:

the force signal is operative to compensate for a gravitational force resulting from a weight of the actuator such that the manipulandum is configured to be manipulated substantially free from the gravitational force.

71. (New) A method, comprising:

receiving sensor data from a sensor associated with a manipulandum coupled to at least one member from a plurality of members, the plurality of members configured to provide at least two rotary degrees of freedom about a pivot point spaced apart from the plurality of members,

the pivot point located at an intersection of axes of rotation of at least two members from the plurality of members, the sensor data being associated with a position of the manipulandum about the pivot point; and

sending a force signal to an actuator associated with at least one of the manipulandum and the plurality of members, the force signal being based on the sensor data.

72. (New) The method of claim 71, wherein:

the manipulandum is disposed on a first side of a plane including the pivot point, the plurality of members being disposed on a second side of the plane different from the first side of the plane.

73. (New) The method of claim 71, the position of the manipulandum is a first position, the sensor data being associated with the first position and a second position of the manipulandum, the force signal being a first force signal, the method further comprising:

selecting a first physical property profile from a plurality of physical property profiles based on the first position of the manipulandum, the first force signal being further based on the first physical property profile, the first physical property profile being associated with a needle advancing in a simulated tissue; and

selecting a second physical property profile from the plurality of physical property profiles based on the second position of the manipulandum, the second force signal being further based on the second physical property profile, the second physical property profile being associated with a needle withdrawing in the simulated tissue.

74. (New) The method of claim 71, wherein:

the plurality of members is configured to execute a medical simulation, the physical property profile being selected based on the position of the manipulandum within a simulated tissue of a simulated patient, the force signal is operative to output forces simulating the manipulandum encountering a simulated bone.

75. (New) The method of claim 71, wherein:

the force signal is operative to compensate for a gravitational force resulting from a weight of the actuator such that the manipulandum is configured to be manipulated substantially free from the gravitational force.